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ABSTRACT

Two hundred and thirty-two articles, research reports, graduate dissertations, and books, published between 1953 and 1973, are listed in this bibliography for scholars, educators, and researchers. The bibliography is a supplement to a report concerning the association between educational outcomes and background variables. A wide range of studies is listed, including investigations of personal, attitudinal, and environmental factors which affect educational outcomes, and several statistical studies of educational outcomes and background variables are highlighted. The relevance of thise studies to the objectives of the National Assessment of Educational Progress is emphasized. (Author/SE)

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ASSOCIATIONS BETWEEN EDUCATIONAL OUTCOMES and BACKGROUND VARIABLES:

A Review of Selected Literature

A P P E N D I X

U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
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1974

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A Project of the Education Commission of the States

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Associations Between Educational Outcomes and Background Variables: A Review of Selected Literature

APPENDIX

by

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Ezra Glaser
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Arthur Kirsch

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Preface to the Appendix

This report presents a bibliography of papers examined by the project staff as part of a review of selected literature on association between educational outcomes and background variables. The user of this appendix volume should refer to the main report, which is to be published as a monograph by the National Assessment of Educational Progress, for a description of the project which gave rise to this bibliography. It is neither comprehensive nor discriminating, but may serve as a useful starting-point for other researchers. Following the bibliography is a set of abstracts of documents having particular relevance to the subject matter of the main report. It is assumed that readers of the main report will want to refer to these abstracts to judge the statistical competency of some of the results cited.

Edward C. Bryant
Project Director

Acknowledgments

Selected abstracts are derived from prior work printed in four volumes of *An Analytical Review of Longitudinal and Related Studies as they Apply to the Educational Process* (1972), by Clare Rose *et al.* of the Center for Study of Evaluation, U.C.L.A. In some cases, we have incorporated entire sections directly from the CSE studies. However, for our present purposes, we have also done further re-ordering, abstraction, and refinement of the material presented in the CSE volumes.

About half of the abstracts given here do not appear in the CSE studies. We have prepared them in a comparable format.

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ABSTRACTS

I. David J. Armor

II. "School and Family Effects on Black and White Achievement: A Reexamination of the USOE Data"

III. In Mostelier, Frederick and Daniel P. Moynihan, eds., *On Equality of Educational Opportunity*. New York: Vantage Books, 1972.

IV. Objectives:

1. To examine, by means of an independent assessment-analysis of the complete data set on elementary schools covered in the Coleman-USOE study, the major conclusions of the "Coleman study."

2. The conclusions are stated as: a) blacks appear to have just as adequate school facilities as whites in most parts of the country; b) aside from the distribution of school quality, the effects of school staff and facilities on achievement do not seem large for either blacks or whites; c) school factors are not as important as the effects of family and community factors.

3. To examine the Coleman data against four methodological/conceptual problems that bear upon policy conclusions drawn from the USOE data:

   Methodological: 1) inherent validity/reliability limitations of self-administered principal/teacher/

student questionnaires; 2) the high non-response rate of these self-administered questionnaires.

Conceptual: 1) definitions of school output, in terms of effects schools are supposed to have on the students; 2) the limitation of cross-sectional studies with respect to causal relationships.

4. To develop a conceptual model of the educational process, for the purpose of evaluating the equality of educational opporunity.

V. Study Design:

1. Study was a re-analysis of data collected by the Coleman study on elementary schools nationwide. Elementary schools were selected because 1) the response rate for elementary schools was good in the Coleman study; 2) the student bodies of elementary schools are relatively homogeneous with respect to measures of community input factors; 3) the three grades--1st, 3rd, 6th--assessed by Coleman permits a comparison of student achievement over a six-year period; 4) the assumption was made that student experiences during the elementary school years can have more important effects on achievement than later schooling.

2. The Coleman sample of elementary schools was further refined, eliminating those schools with grades 1-12 and those elementary schools with student bodies with 25% or more pupils other than black or white in race. Sample was of 1623 elementary schools, 1623 providing data on sixth graders and 880 providing data on first graders.

3. Indices were constructed for a model of educational process: School Input measures; School Output measures; and Community Input measures.

4. Data presented for aggregate school level, schools classified by race: black schools were schools with more than 50% blacks in the student body; white schools were schools with more than 50% whites in the student body.

5. Data presented by geographic region and size of place: Metropolitan (=SMSA) and Nonmetropolitan.

6. Sampling Procedures: a) Data were from the Coleman-USOE Report; the total sample of elementary schools surveyed by Coleman was further refined by eliminating schools with grades 1-12 and schools with student bodies with 25% or more pupils other than black or white in race. b) Weights: A weighting factor was computed for each school, which varied inversely with the probability with which that school was sampled; a weighting factor was computed for each grade, which reflected the grade enrollment and the proportion of among-school variance for various school factors.

VI. Instruments and Measures:

1. Indices were computed from data supplied by the USOE report:

   -Principal questionnaire
   -Teacher questionnaire
   -Teacher verbal achievement test
   -Student questionnaire
   -Student verbal achievement tests, 1st and 6th grades

2. Indices were reported on an aggregate school level:

   a. School Input indices:

      1. school facility index, computed from list of school facilities reported available by principal
      2. teacher professional background, averaging the indices of all teachers in the school; derived from teacher questionnaire
      3. teacher general verbal achievement, averaging the scores of all teachers in the school; derived from the teacher verbal achievement test
      4. annual per-student expenditures, as measured by averaged teacher salaries divided by total number of students in the school.

b. Student Output indices:

1. verbal achievement scores of sixth grade students, averaging the scores of students in the majority race only
2. verbal achievement scores of first grade students, averaging the scores of students in the majority race only

c. Community Input indices:

1. structure of students' families, computing the percent of sixth grade students of both parents living at home
2. occupational status of the father, computing the percent of sixth grade students of both races whose fathers are white collar workers
3. family life style, averaging the indices of all sixth grade students of both races, in terms of appliances in the home
4. education of the students' parents, averaging the indices of all sixth graders of both races, in terms of parents' educational backgrourds.

3. The basic unit in the data presentations was the school, and all data was aggregated on the school level.

-School Input indices were computed for over-all school characteristics, with the schools classified as black (more than 50% black student body and as white (more than 50% white student body).

-School Output indices were aggregated only for black students in black schools and only for white students in white schools

-Community Input indices were aggregated over both races in the school, for sixth grade students only.

VIII. Variables Studied:

1. Intermediate variables:
   1. School facility
   2. Teachers' professional background
   3. Teachers' general verbal achievement
   4. School per capita student expenditures
   5. Structure of family
   6. Occupational status of father
   7. Family life style
   8. Education of the students' parents

2. Outcome variables:
   1. Sixth grade students' verbal achievement

IX. Statistical Procedures:

1. Correlation analyses

2. Multiple regression analyses

X. Relevance to the NAEP Study

There has been substantial criticism of the analysis of the Coleman data. This paper rexamines the analysis, using the school as the unit of analysis. The school variables analyzed are particularly relevant to this study.

I. Jerald G. Bachman *et al*

II. *Youth in Transition. Vol. 1: Blueprint for a Longitudinal Study of Adolescent Boys; Vol. 2: The Impact of Family Background and Intelligence on Tenth-Grade Boys.*

III. Survey Research Center, Institute for Social Research, University of Michigan, Ann Arbor, Michigan, 1967 (Vol. 1) and 1970 (Vol. 2).

IV. Objectives:

1. To assess a number of changes that occur during adolescence, including dimensions of self-concept, values, attitudes, plans, aspirations and behaviors and to determine how these relate to environment characteristics and personal characteristics.

2. To measure the background and personality characteristics of a sample of adolescent boys at three different times during the three year period beginning at tenth grade entrance and ending one year following high school graduation.

3. To determine the characteristics of the school and work environments of these boys in order to assess person-environment fit.

4. To study the school as a formal organization in order to identify the organizational characteristics that relate to the drop-out phenomena.

V. Design of Study:

1. Longitudinal

2. Combines depth of longitudinal study with the breadth of a nation-wide sample.

3. Covers a three year period with interval data collection as follows: October, 1966, March, 1968, and November, 1969.

VI. Description of Sample: Sample I: Probability sample

1. Size of sample:

   a. 2200 boys
   b. 87 schools

2. Population:

   a. All boys in the 10th grade in public high schools in the United States.
   b. All public high schools in the United States as of Summer, 1964, which had at least 15 boys in the 10th grade. This excludes less than 2.5% of all 10th grade public school boys.

3. Sex: males only

4. Racial composition: 1912 whites; 266 blacks; 45 other

   a. The sample of blacks were subdivided into groups based on location and school.

1. 73 attended integrated schools
2. 72 attended northern segregated schools
3. 111 attended sourther segregated schools

b. Number of schools attended by blacks

1. 183 students were in 9 schools (segregated)
2. 73 students were in 25 schools (integrated)

5. Religious composition: 63 percent Protestant; 20 percent Roman Catholic and Eastern Orthodox; 3 percent Jewish; and 14 percent Other and missing data.

6. Sampling procedure:

a. Three step process involving stratification and clustering included:

1. Separation of the United States into 88 strata. The Survey Research Center has developed a sampling framework which divides the United States, excluding Hawaii and Alaska, into 88 strata with each stratum representing about 2 million people. 62 of these correspond to separate counties; the rest are grouped into 12 major metropolitan areas.

2. A random selection of a single school in each of the 88 strata was obtained. The probability of the selection of any school was proportional to the estimated number of 10th grade males.

3. A random sample of thirty boys was obtained within each school.

b. Of the 88 schools drawn according to design, 71 responded affirmatively (81 percent).

c. Replacement schools from the sample areas where schools had responded negatively were secured. 16 out of 17 accepted.

d. Final response rate was 97 percent.

VII. Description of Sample: Sample II: Supplementary, discretionary sample of outstanding schools

1. Size of sample:

a. 300 boys
b. 10 schools

2. Population: 17 schools selected for excellence in one or more of the following areas: academic curriculum, organizational innovation, student-faculty relations, vocational preparation or promoting student mental health.

3. Sampling procedure: Discretionary. Sample population was selected by a panel of experts in education. The names and qualifications of the experts who did the selecting and those who were selected is not given. The final sample consisted of those schools which accepted the invitations.

4. Rationale for supplementary sample: the representative random sample may not include many outstanding schools. It was felt that in a study designed to show what school environments can do, as well as what they typically do, such a defect might be serious, and to insure that there would be a sufficient number of outstanding schools, a special supplementary sample should be chosen.

VIII. Instruments and Measurement (Time 1):

1. A student questionnaire developed by the staff (using some existing instruments and devising additional items) designed to measure:

   a. Affective states
      (e.g., self-esteem, depression, resentment, guilt, impulse to expression, life satisfaction)
   b. Personality dimensions
      (e.g., self-development and self-utilization, need for social approval, fear of failure, test anxiety, flexibility)
   c. School opinions
      (e.g., school influence description, attitudes toward teachers, attitudes toward school, probability of dropping out of school, deviant behavior in school)
   d. Values and attitudes
      (e.g., cultural values, job attitudes, internal vs. external control, political attitudes and information)

e. Life outside of school
(e.g., social and dating behavior, family relationships, physical health and appearance, political and religious preference, socio-economic status, participation in activities)

f. Delinquent behaviors

2. A structured interview designed by the project staff using existing instruments and their own questions were conducted to gather data on the following:

a. Peer relationships
b. Self-concept of school ability
c. General happiness
d. Motives
e. Job history and financial status
f. Future plans, interpersonal influence
g. Person-environment fit, self-identity dimensions
h. Dropping out and reasons for doing so
i. Paragraph comprehension test
j. IQ: from Quick Test of Intelligence developed by Ammons and Ammons (1962)

3. A Group Test Battery used to measure academic abilities and aptitudes consisted of the following:

a. Matrices, patterned after Raven's Progressive Matrices. It is thought to be relatively free from cultural and educational bias (Raven, 1951). The test is considered a useful predictor for individuals who have good reasoning ability but who may have difficulty in school achievement because of non-intellectual factors.

b. Gates Test of Reading Comprehension from the Gates Reading Survey, Teachers College, Columbia University used to measure reading achievement.

c. Anagrams, by Guilford: a verbal task which measures divergent thinking.

d. Maze tracing, a sub-test in the performance section of the Wechsler-Bellevue, was used as a measure of intelligence.

e. General Ability Test Battery (GATB), Pare J: Vocabulary and Part I: Arithmetic Reasoning developed by the U.S. Employment Service designed to measure general intelligence.

f. Hidden patterns, a test obtained from the Kit of Cognitive Factors, developed by French et al, used as an indicator of cognitive style: of field independence-dependence.

g. The Job Information Test, a set of items designed by Karen E. Paige and Jerald G. Bachman, was used to measure knowledge about a wide variety of occupations.

IX. Instruments and Measurement (Time 2 and 3)

1. Will be essentially the same as those used for Time 1 with thes omissions:

a. Aptitudes and abilities
b. Demographic information
c. Future plans (Time 3 only) and these items marked "optional"

1. School motivation
2. Flexibility
3. Self-utilization opportunities (Time 3 only)
4. Family relationships

Instruments for measuring school environments: a special questionnaire was designed to obtain data about each school. Details concerning the data collection were not presented except that data would be collected from school staff. The topics that were to be covered in the questionnaire were as follows:

1. Inputs required by school
   (e.g., personnel, operating funds, buildings equipment and maintenance service)
2. Processes of allocation of inputs
   (e.g., extent to which staff of school is influential in procurement and allocation)
3. Resources currently held by the school
   (e.g., personnel, students, building grounds, equipment)
4. The School's Role System
   (e.g., stability of roles, changing role system, changing role occupants, balance between role prescriptions and individual role elaboration among teachers, evaluation of the system of roles, socialization of new members, evaluation of role performance, rewards and penalties, sources and nature of control of inputs, composition of role sets, maintenance of role occupancy)

5. Openness and closeness
(e.g., changes in students: do they have increased skills and knowledge?; have they formulated career plans?; have they "matured"?)
6. Additional properties of organizational structure (e.g., size, degree of specialization, group norms, group structure)

Instruments for measuring work environments: not described.

X. Variables Studies:

Background variables:
1. Student general background
2. Student aptitudes and abilities
3. Student physical characteristics
4. Student job history
5. Student history of schooling

Intermediate variables:
1. Student motives
2. Student affective states
3. Student self-concept
4. Student values
5. Student attitudes
6. Student plans
7. Student behaviors
8. Student role characteristics
9. Environmental variables--family
10. Environmental variables--interpersonal influences
11. Environmental variables--school
12. Environmental variables--community

Outcome variables:

1. Levels of vocational preparation
2. Levels of aspiration
3. Levels of skill, knowledge
4. Levels of self-esteem and affective states
5. Levels of satisfaction, self-utilizations, self-development
6. Levels of self-concept
7. Levels of attitudes
8. Levels of Motivation
9. Levels of behavior
10. Levels of amount of role conflict

XI. Statistical Procedures

1. Three broad strategies carried out sequentially are used:

   a. Index construction

      1. In general, indices will be calculated by finding the arithmetic mean of the scores attained by a respondent on a number of items which are designed to measure a common characteristics.
      2. Clusters of highly intercorrelated indices within the same general category will be identified. The same general strategy used in index construction will be applied but in this case, the cluster scores will be based on the means of inter-related indices; in effect each such score will be an index of indices.

b. Correlational and multiple classification procedures will be used to examine the relationship which exists between pairs of variables.

c. Longitudinal analysis

1. Comparison of measurements taken at two or three different points in time to assess causal directions underlying relationships.
2. Assessment of proportion of total change taking place in each interval. This will be used in examination of traits which are believed to be developing in a systematic fashion.

2. Descriptive statistics used to examine descriptive data include means, standard deviations and response distributions.

XII. Relevance to NAEP Study

Even though the study covers only 10th grade males in public schools, it produces associations that are consistent with other studies of a more general nature. This study was carefully designed and implemented and the analysis was done in such a way as to permit examination of principal association with and without adjustment for other major associations. The presentation of data in Volume II is particularly clear.

I. James S. Coleman *et al.*

II. *Equality of Educational Opportunity.*

III. National Center for Educational Statistics, Department of Health, Education, and Welfare, Washington, D.C., 1966.

IV. Objectives:

1. To discern possible relationships between students' achievement and the kinds of schools they attend.

2. To determine the extent to which the racial and ethnic groups are segregated from one another in the public schools.

3. To determine whether or not the schools offer equal educational opportunities in terms of a number of criteria which are regarded as good indicators of educational quality (e.g., number of laboratories, textbooks, libraries, etc.; characteristics of the teachers and characteristics of the student bodies).

4. To determine how much students learn as measured by their performance on standardized achievement tests.

V. Study Design:

1. Purpose is descriptive, to provide estimates for a number of school, teacher, and student characteristics in public schools across the nation; to provide separate estimates for urban and rural localities in major geographic regions; to provide reliable estimates so that comparison can be made between Negro and other minority students with white students.

2. Data collected from a cross-sectional survey of public elementary and secondary schools in the United States.

3. Survey data collected from: a) student questionnaires and tests of verbal ability, reading, and mathematics; b) teacher, principal, and superintendent questionnaires.

4. Target population: elementary and secondary school students in U.S. public schools; teachers, principals, and superintendents in U.S. public schools.

5. Experimental population: Stratified sample of public elementary and secondary schools in the United States.

VI. Sampling Procedures:

1. Sampling design based on a two-stage probability sample of the public schools in the United States.

2. Primary sampling unit (PSU) used was 2,883 counties of which 209 were metropolitan areas and 2,674 were counties located outside metropolitan areas.

   Counties were chosen because (1) census and other descriptive data were readily available for counties and (2) the county more than local school districts would provide greater internal heterogeneity which is more efficient.

3. Counties were then assigned to one of two groups, metropolitan or nonmetropolitan, according to whether they were included in a standard metropolitan statistical area (SMSA) or not.

4. The groups were then stratified by geographical location and by the percentage of non-whites in the PSU. The boundaries for the percentage nonwhite categories were set at:

   a. 70% and over
   b. 30 - 70%
   c. 10 - 30%
   d. Under 10%

   In nonmetropolitan counties the last category was broken down into:

      1. Estimated nonwhite enrollment of 100 or more

      2. Estimated nonwhite enrollment under 100

5. Within each county and metropolitan area that was selected in the first stage, a listing of all public secondary schools with the 12th grade was obtained from the inventory of school plants. These listings were sent to the various State departments of education where the percent nonwhite enrollment in each school was indicated.

   The secondary schools were then stratified into five groups according to nonwhite enrollment:

   a. 75.1 - 100%
   b. 50.0 - 75%
   c. 25.1 - 50%
   d. 10.1 - 25%
   e. 0 - 10%

6. Estimated 12th grade enrollment took into account differences in grade span.

7. Feeder schools: For each secondary school selected in the sample, the lower grade schools which feed their students into that secondary school were identified in addition to the percent of the feeder school students ordinarily attending the high school.

   Each feeder school sending 90% or more of its students to a sampled high school was selected in addition to feeder schools with probability equal to the percent of students who go on to the sampled secondary school.

VII. Description of Samples:

A. Populations

Institutions	Number sampled
Public secondary school principals	1,170
Public elementary school principals	3,223
Students--all students in grades 3, 6, 9, 12 in sampled schools; for grade 1, only half the fraction of students sampled in the other grades.	900,000

B. Representativeness of Sample

High School Principal Non-response: 66 of the 352 secondary schools that did not return a principal questionnaire were subsampled and surveyed; information from 66 schools combined with questionnaires of 818 principals who had originally responded, from which estimates of nation-wide average high school characteristics for whites and nonwhites were calculated.

School Characteristics: the information derived from the follow-up examination of 66 schools indicates that the overall availability of school characteristics stated in this report was understated by about 1 percentage point on the average. The difference between the availability to whites and nonwhites is also understated by about 1 percentage point, on the average.

Student Response Errors: Revised questionnaires for grades 3, 6, 9, and 12 consisting only of items that could be verified by school records were administered in two districts in Tennessee, one metropolitan, one nonmetropolitan. This study concluded that pupils responded with reasonable accuracy to factual items about themselves, their schooling, and their family and homes.

VIII. Variables Studied:

Background variables:

1. General background
2. Student Behavior
3. Academic variables--dropout, grade point average, education history, aspirations
4. SES of family
5. Father's occupation
6. Parents' education
7. Academic expectations of parents
8. Structural integrity of home (presence of father)
9. Other language spoken in home

Intermediate variables

1. Student body characteristics
2. Education of parents of classmates
3. Facilities
4. Special services
5. Special programs
6. Tracking
7. Racial interaction
8. Curriculum

9. Extracurricular activities
10. Faculty attitudes (race-related issues, school policy)
11. Principal and superintendent attitudes on policies and issues.

Outcome Variables

1. Student ability and achievement
2. Student behavior

IX. Instruments and Measurement

1. Achievement tests to measure accomplishments of school, criterion of achievement

A. Grade 1

1. picture vocabulary test - verbal ability
2. association and classification tests - nonverbal ability

B. Grade 3

1. picture vocabulary test - verbal ability
2. classification and analogies - nonverbal ability
3. reading and math tests

C. Grade 6

1. classification and analogies - nonverbal
2. reading and math

3. sentence completion and synonym tests - verbal

D. Grade 9

1. classification and analogies - nonverbal
2. reading and math
3. sentence completion and synonym tests - verbal
4. general information

Test battery of published school survey tests:

ETS Sequential Tests of Educational Progress (STEP reading and math)
Inter-American Tests of General Ability - nonverbal
ETS School and College Ability Test (SCAT) - verbal comprehension

X. Questionnaires

A. Student

1. Grade 1 (teacher fills in)
race, family size, education of parents, father's work, items in home, behavior, learning ability, etc.

2. Grade 3
sex, race, size of family, satisfaction with school books in home, academic standing, expectations of parents, etc.

3. Grade 6
size of family, age, sex, race, education of parents, items in home, academic expectations of parents, racial composition of class, race of teacher, expected occupation, etc.

4. Grade 9 and 12
type of community grew up in, family size, foreign language in home, occupation of father, education of parents, items in home, academic program, educational expectations of parents, race of classmates and teacher, college plans, race of friends, extracurricular activities, grade average, track in English, work, counselor, opinion items, etc.

B. Principal

1. Existence of kindergarten, instructional programs, facilities, books in library, achievement tests, free lunches, equipment, tenure system, attendance, transfers and dropouts, destruction, drugs, nonwhites, programs, postgraduate, representatives from colleges, reputation of school, personal (e.g., degree, years experience, college, field, racial composition of his college, location of college), tracking in school, policy for slow learners and advanced, special classes, opinion items on educational policy, e.g., bussing.

C. Teacher

1. Sex, race, parents education, major, degree, academic level of college, teaching experience, assignment to present school, salary, academic ability of students, satisfaction with job, racial composition of class, opinion on school issues, learning-related problems (e.g., home environment), counseling, test of verbal ability.

D. Superintendent

1. Assignment of teachers, qualification of teachers, current school issues, personal information (age, sex, degree, race), appointed or elected, system statistics, expenditures, etc.

XI. Statistical Procedures

A. Multiple regression analysis

B. Correlation matrices for major regressions

C. Ratio-estimate procedure

D. Analysis of variance

E. Single-variable correlations

XII. Relevance to NAEP Study

The Equality of Educational Opportunity survey, usually identified as the Coleman Study, was conducted in response to Section 402 of the Civil Rights Act of 1964. It was a large scale survey to investigate the associations between outcomes and school factors such as facilities, services, staff, curricula, racial mix, and so on. In the course of the investigation, a great quantity of student characteristics, family background and community variables were collected and used in the analysis to adjust the differential outcomes for such background factors. Thus, the study provides basic data which were analyzed extensively in the Coleman report itself as well as subsequently by many others, notably Mayeske, Smith and Armour. Their findings are particularly relevant to the NAEP project.

I. L.C. Comber and John P. Keeves

II. *Science Education in Nineteen Countries.* International Studies in Evaluation I.

III. Stockholm, Sweden: Almquist and Wiksell, 1973.

IV. Objectives:

1. To devise cross-national measures of achievement in Science, based on a systematic analysis of the curricula in participating countries.

2. To apply these measures to probability samples of students from different countries in order to to devise acceptably accurate national profiles of achievement.

3. To determine how these profiles relate to school, home, and national circumstances.

4. To assess the state of Science curricula cross-nationally and determine relationships between Science curriculum innovations and student achievement.

5. To examine relationships between different teaching methods and student achievement in Science; especially the efficacy of teaching methods based on actual investigations carried out by the students in a scientific manner.

V. Design of Study

1. Study was a cross-national survey: Australia, Belgium (French- and Flemish-language speaking), Chile, England, Federal Republic of Germany, Finland, France, Hungary, India, Iran, Italy, Japan, Netherlands, New Zealand, Scotland, Sweden, Thailand, and the United States. It was hoped to isolate curricula differences between under-developed countries and industrialized countries.

2. Sampling

   a. Primary sampling unit was the school, selected by probability according to various stratifications.

   b. In each country, subsamples of students were randomly selected from sampled schools:

      Population I -- 10 year olds
      Population II -- 14 year olds
      Population IV -- in last year of secondary school
      Population IVS -- Students majoring in Science in school. These students were not reported on in the report.

c. In each school, a sample of teachers of Science was selected to provide pertinent information.

d. For school information, a consensus was taken, so no sub-sampling was done.

3. Instruments were designed to measure:

a. Student achievement in Science

b. Student achievement in five scientific areas: Earth Science, Biology, Chemistry, Physics, practical application (laboratory work and experiment design).

c. Student attitudes toward school and Science study

d. Student motivation, interests, etc.

e. Student characteristics

f. Home/family characteristics

g. Teacher characteristics

h. Learning enviornment

i. School characteristics

j. National eco-cultural-educational characteristics

4. To assess differences between countries, data was aggregated for all sampled ivdividuals within the country; to assess differences between schools, data was aggregated on school level; to assess differences between students, data was aggregated across all students in the total sample as well as considering the student as the unit of analysis.

VI. Description of the sample

1. For all countries except India, Iran, and the U. S., two-stage sampling was used.

   a. Schools were stratified and randomly sampled inversely proportional to size, region, type of school, or sex.

   b. Within each school, a random sample of students was drawn.

2. India, Iran, and the United States used a three-stage sample, first sampling administrative units or school districts.

3. Students samples were drawn from the following target populations (excluding those students in special classes, mentally or physically handicapped):

   Population I -- students 10 years' of age; all students taught by one general class teacher;

   Population II -- students 14 years' of age; point before dropouts occur;

Population IV -- students in last year of secondary school; should be most sophisticated in Science knowledge and application

4. A sample of teachers for Population I and Science teachers for Populations II and IV were selected.

5. Each sampled school was surveyed for school information.

6. Weights were developed to adjust for over- and under-sampling.

VII. Instruments and Measures

1. To measure student achievement in Science:

   a. Test measuring scientific knowledge and abilities, with two attributes -- subject matter (Earth Science, Biology, Chemistry, Physics, practical ability) and four behaviorial objectives (Functional Understanding, Understanding, Application, Higher Processes).

   b. Incorporated into this test were pencil and paper practical items, to measure practical abilities in Science (optional with each country).

   c. Understanding the Nature of Science measure, to assess the students' ability to understand the nature and methods of Science as distinct from its actual content

d. Achievement tests in the four subject areas, for Science majors-Population IVS.

2. To measure general cognitive ability

   a. Word Knowledge test

3. To measure student motivation, interests, attitudes toward Science and Science classes

   a. Interest-in-Science scale (Population I, II, IV)

   b. Description of Science Teaching scale (Population I)

   c. Attitude towards School-Science scale (Population II, IV)

   d. Attitudes towards Science in the World scale (Population II, IV)

   e. Description of Science Teaching -- Textbook/ Experimental (Population II, IV)

   f. Description of Science Teaching -- Laboratory work: Structured/Unstructured (Population II, IV)

   g. Student Questionnaire

4. To collect data on student background, characteristics, home/family characteristics

   a. Student Questionnaire

5. To collect information on the school

   a. Teacher Questionnaire

   b. Teacher Science Questionnaire

c. School Questionnaire

d. School Behavior index, filled out by students on the degree of flexibility/rigidity of school discipline

e. Opportunity to Learn (Science) measure, completed by sampled teachers, assessing whether the content of test items was covered in the school Science curriculum.

f. Holding Power of the school, an index of the retention power of the school.

5. To collect information on the teacher

a. Teacher Questionnaire

b. Teacher Science Questionnaire

c. Likert-type attitude scales (Only sample of 100 teachers)

6. To collect information on countries

a. National Case Study Questionnaire, completed by each IEA National Center.

VIII. Variables studied

Between Country

Indices of economic development: GNP per capita, % GNP obtained from non-agriculture, % work force in non-agriculture, % women in all occupations

Opportunity to learn

Holding Power

Growth Scores

Degree of excellence

Between School

Population I

School Handicap Score: Father's occupation, Father's education, Mother's education, use of dictionary in home, number of books in the home, family size

age of students in the sample
sex of students in the sample
type of school
teaching methods
grade level of students in the sample
size of class
students have regular science lessons?
students have a textbook for Science?
students make observations and do experiments?
students make up own problems and design experiments?
kindred variables: like school, school motivation, hours T.V. watched per day, hours spent reading for pleasure

Population II

Block 1: Home and Student Background

School Handicap Score (a composite variable)

Age of Student

Sex of Student (Male 1; Female 2)

Block 2: School or Program

Type of program or course

Type of school

Block 3: Learning Conditions in the School

Percent male teachers on school staff

Number of laboratory assistants

Sex of Science teachers in sample (Male 1; Female 2)

Opportunity to learn

School behavior scale

Homework in Science (a composite variable)

- Hours homework per week
- Total Science homework per week in hours

Study of Science (a composite variable)

- Currently taking Science
- Total study of Science in years
- Total hours current study of Science

Block 4: Kindred Variables

Science interests and attitudes (a composite variable)

- Science interests and activities scale
- Science in the world scale
- Importance of Mathematics

Expected education and occupation (a composite variable)

- Expected education
- Expected occupation

Science reading (a composite variable available only for certain countries)

Reading Science and technical books and magazines

Reading Science fiction

Reading Science articles in newspapers

Preference for Science and nature programs on TV or radio

Population IV

Block 1: Home and Student Background

School Handicap Score (a composite variable)

Block 2: School or Program

Type of program

Type of school

Block 3: Learning Conditions in the School

Total enrollment

Percentage teachers male and Science (a composite variable)

Percentage male teachers in school

Percentage Science teachers in school

Sex of Science teachers in sample (Male 1; Female 2)

Number of ancillary staff (a composite variable)

Number of laboratory assistants

Total number of ancillary staff

Teacher training (a composite variable)

Teacher's post-secondary schooling

Extent of teacher training in Physics

Extent of teacher training in Biology

Teaching methods: Use of drill materials

Opportunity to learn items tested

Homework per week in hours

Total Science homework per week in hours

Study of Science (a composite variable)

Currently taking Science

Total study of Science in years

Total hours current study of Science

Block 4: Kindred Variables

Science interests and attitudes (a composite variable)

Science interests and activities scale

Science in the world scale

Importance of Mathematics

Expected education and occupation (a composite variable)

Expected education

Expected occupation

Between - Student

Population I:

Block 1: Home and Student Background

Home circumstances (a composite variable) = school handicap

Age of student

Sex of student

Block 2: Type of School

Block 3: Learning Conditions in the School

Total enrollment

Coeducation at Population 1

Pupil teacher ratio

Percentage male teachers

Sex of teacher

Opportunity to learn

Grade

Class size

Hours homework per week

Regular Science lessons

Science textbook available

Observations and experiments

Design own experiments

Block 4: Kindred Variables

Like school

School motivation

Parents help with homework

Hours TV watched per day

Hours reading for pleasure

Population II

Block 1: Home and Student Background

Home circumstances (a composite variable) = school handicap

Age of student

Sex of student

Block 2: Type of School or Course

Type of program

Type of school

Block 3: Learning Conditions in the School (Selected variables only)

Total enrollment

Percentage Science teachers

Sex of teacher

Teacher subject association membership

Part of time employed

Opportunity to learn

Grade

Hours homework per week

Total years' study of Science

Currently taking Science

Block 4: Kindred Variables

Like school

School motivation

Science interests and attitudes (a composite variable)

Science interests and activities (3)

Science in the world scale (2)

Importance of Mathematics (1)

Expected education

Hours reading for pleasure

Science reading (a composite variable)

Reading Science and technical books (1)

Reading Science fiction (1)

Reading Science articles in newspapers (1)

Viewing Science TV programs (1)

Population IV

Block 1: Home and Student Background

Home circumstances (a composite variable) = school handicap

Age of student

Sex of student

Block 2: Type of School or Program

Type of school

Type of program

Block 3: Learning Conditions in the School

- Total enrollment
- Teacher's post-secondary schooling
- Subject association membership
- Teacher training in Biology
- Involved in Science curriculum reform
- Students plan investigations
- Teacher preparation in school hours
- Grade
- Total years study of Science
- Science study and homework (a composite variable)
  - Total hours study of Science (1)
  - Total hours Science homework (1)

Block 4: Kindred Variables

- Science interests and attitudes (a composite variable)
  - Science interests and activities (3)
  - Science in the world scale (1)
  - Importance of Mathematics (2)
- Expected education
- Expected occupation
- Hours reading for pleasure
- Science reading (a composite variable)
  - Reading Science and technical books (2)
  - Reading Science fiction
  - Reading Science articles in newspapers (2)
  - Viewing Science TV programs (1)

Outcome variables

- Student achievement in Science, cognitive
- Student achievement in Science, practical application

IX. Statistical Procedures

1. Correlation analyses

2. Multiple regression analysis

3. Factor analyses

X. Relevance to the NAEP Study

This is an important publication in the International Evaluation Series. It is one of the few studies that shows an important sex difference (for 12th grade students).

I. John C. Flanagan and William W. Cooley

II. *Project Talent One-Year Follow-Up Studies.*

III. Cooperative Research Project No. 2333. School of Education, University of Pittsburgh, Pittsburgh, Pennsylvania, 1966.

IV. Objectives:

1. To examine the relationships between high school student characteristics and the educational and occupational choices students make one year after they are graduated from high school.

2. To examine the nature of career development of American youth--the experience of employment, the nature of job satisfaction, and the nature and extent of post-secondary education.

3. To prepare a comprehensive counseling guide indicating the patterns of aptitude and ability that are predictive of success and satisfaction in various post-secondary career/educational choices.

4. To provide a better understanding of the educational experiences which prepare students for their lifework.

5. To develop an inventory of human resources.

6. To develop a set of standards for educational-psychological measurements.

V. Design of the Study:

1. Project TALENT is a 20-year longitudinal survey of school students who were tested by TALENT in 1960 while in grades 9, 10, 11, and 12. These Follow-up Studies examined various career/educational aspects and characteristics of each grade one year after the students had been graduated from high school.

2. Data from 1960 were baseline data, which were used as the basic independent variables.

3. Each Follow-up Study explored a different aspect of post-secondary career/educational alternatives: post-secondary education choice; differences among college students; post-secondary work choice; stability of career plans; predicting career plan changes; redefining career plan groupings.

4. Sampling: Using the TALENT 1960 survey population as its base, the Follow-up Project attempted to survey the entire population of each grade one year after it had been graduated from high school. A special effort was made to avoid response bias by subsampling among initial non-respondents to this follow-up survey and collecting data from them through various agency means.

5. Instruments were constructed to measure student ability, knowledge, interests, satisfactions, plans, home factors, and school activities.

6. A trait and factor approach was used. Traits were measured in school, and relationships were sought between traits and subsequent vocational/educational behavior.

VI. Description of the Sample:

1. a. The TALENT sample was of all students in grades 9-12 attending, in 1960, between 4-5% of all secondary schools in the United States.

   b. Schools were selected by a stratified random sampling of all senior high schools and associated junior high schools, stratified by: category of school (public, parochial, private); geographical area; size of senior class (public schools only); and retention ratio (public schools only).

   c. 1225 schools participated, add data was collected from approximately 400,000 students.

2. a. The Follow-up Project attempted to survey all students in the respective grade one year after it had been graduated from high school.

b. The numbers of responses, including follow-up of initial non-respondents were:

Grade 12	62,404
Grade 11	48,404
Grade 10	54,299
Grade 9	47,470

VII. Instruments and Measures:

1. Instruments consisted of a two-day battery of tests and questionnaires: TALENT Test Battery

   Student Information Blank Questionnaire

2. Instruments were designed to measure:

   a. students' specialized aptitudes
   b. students' general ability
   c. students' interests and temperament
   d. home background
   e. plans for the future

3. These various measures were combined into two major trait categories:

   ability (general intelligence, aptitudes, knowledges)
   motive (needs, interests, life style)

4. The ability battery consisted of 60 distinct measures; the motive battery consisted of 27 different measures. These measures were the pool of information from which pertinent measures were extracted to answer the varying questions posed in the Follow-up Project.

5. An additional variable--SES--was made up by scaling information from 9 student background variables.

VIII. Variables Studied:

Background variables

Student sex

Family SES level: father's education, mother's education; father's occupation; number of books in the home; student has his own room; appliances; T.V., radio, etc.; family income; value of home.

Environmental Stability: number of school changes; time since last school change; number of school days absent; hours per day spent studying; time lived in the same community.

Student ability

Aptitude:

The 15 tests in the TALENT battery which can be classified as aptitudes are:

R-211 Memory for Sentences: the ability to memorize simple descriptive statements and recall a missing word when the rest of the sentence is provided sometime later. (16 items)

R-212 Memory for Words: the ability to memorize foreign words corresponding to common English words. (24 items)

R-220 Disguised Words: the ability to become used to "strange" modes of spelling ordinary words, i.e., the puzzling out from context and appearance the meaning of a word which is vaguely reminiscent of a familiar English word. (30 items)

R-240 Word Functions in Sentences: a measure of sensitivity to grammatical structure which does not employ the terminology of grammar; the ability to understand the structure of a sentence and to recognize the function of each word or phrase in the sentence. (24 items)

R-250 Reading Comprehension: the ability to comprehend written materials; the subject reads a passage and then answers questions about it, referring back to the passage as often as he likes. (48 items)

Creativity: the ability to find ingenious solutions to a variety of practical problems. (20 items)

Mechanical Reasoning: the ability to visualize the effects of the operation of everyday physical forces (such as gravitation) and basic kinds of mechanisms (for instance, gears, and pulleys, wheels, springs, levers). (20 items)

Visualization in Two Dimensions: the ability to visualize how a figure would look after manipulation in three-dimensional space, by folding a flat figure to make a three-dimensional figure. (16 items)

Abstract Reasoning: the ability to determine a logical relationship or progression among the elements of a complex nonverbal pattern, and to apply this relationship to identify an element that belongs in a specified position in the pattern. (15 items)

Arithmetic Computation: the ability to add, subtract, multiply, and divide whole numbers quickly and accurately. (72 items)

Table Reading: the ability to obtain information from tables quickly and accurately. (72 items)

Clerical Checking: the ability to compare pairs of names to determine quickly and accurately whether they are identical. (74 items)

Object Inspection: the ability to spot differences in small objects quickly and accurately when comparing them visually. (40 items)

Preferences: the ability to make a rapid choice of one from each of many adjectival pairs indicating the kind of friend the subject would prefer to have. (166 items)

Knowledge traits:

Spelling: the ability to spell fairly common words. (16 items)

Capitalization: knowledge of the rules of capitalization and how to apply them. (33 items)

Punctuation: knowledge of the appropriate use of all standard punctuation marks, with special emphasis on sentences. (27 items)

English Usage: the ability to recognize which of several ways of expressing something is preferred usage. (25 items)

Effective Expression: ability to recognize clear, concise, smooth prise expression of an idea. (12 items)

Arithmetic Reasoning: the ability to solve arithmetic problems, with no emphasis on computing skill. (16 items)

Introductory Mathematics: knowledge of elementary algebra, fractions, decimals, per cents, square roots, intuitive geometry, and elementary measurement formulas; topics usually taught up to and including grade 9. (24 items)

Advanced Mathematics: knowledge of plane geometry, solid geometry, algebra, trigonometry, analytic geometry, and introductory calculus; topics normally taught in grades 10-12 in college preparatory courses. (14 items)

Information traits:

Screening: a test of extremely basic, simple knowledge designed to identify mentally retarded, functional illiterates and uncooperative students. (12 items)

Vocabulary (21 items)
Literature (24 items)
Music (13 items)
Social Studies (24 items)
Mathematics (23 items)

Mechanics (19 items)
Farming (12 items)
Home Economics (21 items)
Sports (14 items)
Art (12 items)
Law (9 items)
Health (9 items)
Engineering (6 items)

R-107 Physical Sciences (18 items)
R-108 Biological Sciences (11 items)
R-109 Scientific Attitude (10 items)
R-110 Aeronautice and Space (10 items)
R-111 Electricity and Electronics (20 items)

R-140 Practical Knowledge (4 items)
R-141 Clerical (3 items)
R-142 Bible (15 items)
R-143 Colors (3 items)
R-144 Etiquette (2 items)
R-145 Hunting (5 items)
R-146 Fishing (5 items)
R-147 Outdoor Activities (other) (9 items)

Architecture (6 items)	R-148 Photography (3 items)
Journalism (3 items)	R-149 Games (sedentary) (5 items)
Foreign Travel (5 items)	R-150 Theater and Ballet (8 items)
Military (7 items)	R-151 Foods (4 items)
Accounting (10 items)	R-152 Miscellaneous (10 items)

Needs:

Sociability (12 items)
Social Sensitivity (9 items)
Impulsiveness (9 items)
Vigor (7 items)
Calmness (9 items)
Tidiness (11 items)
Culture (10 items)
Leadership (5 items)
Self-Confidence (12 items)
Mature Personality (24 items)

Interests:

Physical Science, Engineering, Mathematics (16 items)
Biological Science, Medicine (8 items)
Public Service (11 items)
Literary, Linguistic (16 items)
Social Service (12 items)
Artistics (7 items)
Musical (5 items)
Sports (8 items)
Hunting, Fishing (3 items)
Business Management (14 items)
Sales (6 items)
Computation (10 items)

Office Work (7 items)
Mechanical, Technical (15 items)
Skilled Trades (18 items)
Farming (7 items)
Labor (10 items)

Life Style:

No scales set up as of date of report.

Outcome variables

1. Educational choice:

Males	Females
four-year college	four-year college
junior college	three-year nursing school
Armed Forces school	junior college
technical institute	secretarial/business school
trade/apprentice school	trade school
no post-secondary ed	no post-secondary ed

2. Colleges selected:

Boston University
Bradley University
Carnegie Institute of Technology
Columbia University
Cornell University
Drake University
Drexel Institute of Technology
Duke University
Fairleigh Dickinson University

George Washington University
University of Hartford
Hofstra University
Long Island University
Massachusetts Institute of Technology
University of Miami, Florida
New York University
Northeastern University
Northwestern University
Pace University
University of Pennsylvania
University of Pittsburgh
Polytechnic Institute of Brooklyn
University of Rochester
Stanford University
Syracuse University
Temple University
Washington University (St. Louis)
Western Reserve University

3. Major Fields of Study in College:

Males

1. Mathematics
2. Physical Science
3. Biological Science
4. Social Studies
5. English and Literature
6. Languages and Fine Arts
7. Psychology
8. Education
9. Engineering
10. Business
11. Agriculture and Forestry

Females

1. Math and Physical Science
2. Biological Science
3. Social Studies
4. English
5. Languages and Fine Arts
6. Psychology
7. Education
8. Business
9. Home Economics
10. Nursing

4. Career Stability: (for those who did not go on to college)

Business (managerial)
General clerical
Draftsman
Salesman
Electronic technician
Electrician
Machinist
Carpenter
Metal tradesman
Painter
Driver
Printer
Laborer
Farmer

5. Stability of Career Plans

1. Mathematician
2. Physical scientist
3. Biological scientist
4. Engineer
5. Physician
6. Dentist
7. Nurse
8. Pharmacist
9. Psychologist, sociologist
10. Social worker
11. Clergyman, etc.
12. Government
13. Lawyer
14. Teacher
15. Accountant
16. Businessman
17. Writer
18. Artist, entertainer
19. Engineering, scientific aide
20. Aviation
21. Medical technician
22. Office worker
23. Salesman
24. Armed Forcps
25. Protective
26. Skilled worker
27. Structural worker
28. Housewife
29. Barber, beautician
30. Farmer

IX. Statistical Procedures:

1. Multivariate analyses of variance
2. Multiple group discriminant analyses
3. Mahalanobis D^2 analyses
4. Classification probabilities analyses
5. Scaled discriminant vector analyses
6. Correlation analyses--multiple, canonical

X. Relevance to the NAEP Study

This is only one of a long series of publications on Project Talent. This one provides the principal analysis of the associations between outcomes (knowledge - abilities - interests, etc.) and background factors. Most of the analyses were done on a sample of responses to the main project, but sample sizes still are large. This report also is one of the principal reports that analyses postsecondary choice in education and occupation.

I. Walter I. Garms

II. *An Approach to the Measurement of Educational Need: The Relationship Between Socioeconomic Characteristics and Pupil Achievement in Basic Skills in Early Elementary School.*

III. Submitted to the New York State Commission on the Quality, Cost, and Financing of Elementary and Secondary Education, Albany, New York, August 1971.

IV. Objectives:

1. To examine the possible connections between socio-economic status of students and their performance on standardized achievement tests, in order to develop SES proxy measures for assessing cultural deprivation.

2. To develop SES criteria measures that could be built into an accountability mechanism that would facilitate comparisons of effectiveness among schools.

3. To develop SES criteria measures that could be used as an element in the governmental distribution of funds, on the basis of educational need, to public schools.

4. To test interactions among predictor SES variables in hopes of improving the predictive value of other than racial-ethnic factors.

V. Design of the Study:

1. Study was an assessment and manipulation of test results of a sample of third grade students on the New York State Achievement Tests on Reading and Arithmetic, 1970.

2. The present study was to test a larger sample of schools than did the author's previous study (Garms and Smith, "Development of a Measure of Educational Need and its Use in a State School Formula" (Albany: New York State Educational Conference Board, 1969)), for the purposes of improving the validity of this study and enhancing its political acceptability.

3. Sampling:

   a. The school was the primary sampling unit, randomly selected from a universe of schools stratified by geographical location in New York State.

   b. Within each sampled school, twenty third-grade students were to be systematically subsampled. All pupil data were aggregated to school level.

4. The dependent variable - low achievement on the New York State Achievement test in Reading plus low achievement on the Achievement in Arithmetic - was defined as the percentage of sampled students from each school who scored below the fourth stanine in reading plus the percentage of students who scored below the fourth stanine in arithmetic.

5. Test results were on record at the school. Other data collected in this study were:

   a. SES predictor items for each sampled student, aggregated to school level

   b. information obtained from the school principal on community and school attendance area characteristics.

VI. Description of the Sample:

1. A two-stage sample was used:

   a. Schools were stratified by geographic locale in New York State - New York City, New York SMSA, Other Urban, Upstate SMSAs, Non-SMSA - and a random sample of 428 schools was selected.

   b. Within each sampled school, school officials were to select from some available source every nth student in the third grade, until they were able to obtain data for twenty students. These data on the twenty students were then averaged to obtain values for the school as a whole.

   c. The number of schools selected, the number of usable returns, and the response rate, all by stratum, are:

Stratum	Sampled	Usable Returns	Response Rate
New York City	90	65	72%
New York SMSA	87	52	69
Other Urban	75	53	61
Upstate SMSA	86	63	73
Non-SMSA	90	68	76
Totals	428	301	70.3%

VIII. Instruments and Measures:

1. Student achievement was measured in terms of third grade results on the 1970 New York State Achievement tests in Reading and Arithmetic.

2. SES variables were obtained from the school records of sampled third grade students. Some items may have required the school to contact the pupil's parents for information.

3. A questionnaire, completed by the principal, collected his perceptions of school area parental income level, character of housing of the school attendance area, and dominant characteristic of the community. The last was used as a possible stratification device, not as a variable. The other two variables were eliminated because the responses were to arbitrary, consisting of the principal's unsupported opinion.

VIII. Variables Studied:

Intermediate variables and Independent variables

a. Racial-ethnic category: Black, Puerto Rican, other
b. Broken home: not living with both parents
c. Eligible for free lunch program
d. Level of parents' education
e. Overcrowded home: more people living in dwelling than there are rooms
f. Dwelling owned or rented
g. Mobility from school to school since entering elementary school
h. Parents' occupation

Outcome variable

Third grade achievement level: for each school, percentage of twenty students scoring below the fourth stanine in reading achievement plus the percentage of student scoring below the fourth stanine in arithmetic achievement, as measured on the 1970 New York State Achievement tests.

IX. Statistical Procedures:

1. Correlation analyses
2. Multiple regression analyses
3. Step-wide regression analyses
4. Linear regression analyses
5. Double log regression analyses
6. Chow test for homogeneity of regressions

X. Relevance to the NAEP Study

This is a large-scale statewide assessment where the background data were largely obtained from school records. Unfortunately (for our purposes) the school rather than the pupil is the unit of analysis. The application of associations between background and achievement to the setting of accountability standards is an interesting one.

I. Torsten, Husén, ed.

II. *International Study of Achievement in Mathematics: A Comparison of Twelve Countries* (2 Vols.).

III. Stockholm, Sweden: Almquist and Wiksell and New York: John Wiley & Sons, 1967.

IV. Objectives:

1. To determine the influence of societal changes in patterns of living and the development of industrial and technical products upon mathematics teaching and learning.

2. To locate differences in various types of school systems both between and within countries on performance in mathematics on the basis of both system input and output variables.

3. To investigate the effect of school organization, selection procedures, and differentiation upon students' mathematics performance and attitudes toward mathematics.

4. To compare the differential effects of curriculum and methods of instruction on students' performance in and attitudes towards mathematics.

V. Design of Study:

1. Cross-national survey.

2. Four-year period from June, 1961 to December, 1965.

3. Actual test construction of instruments began in March, 1962 and the cross-national testing was accomplished between January and June of 1964. Instruments were administered one time only.

VI. Description of the Sample:

1. Population:

a. Countries: 12 countries were included in the study, as follows: Austrialia, Belgium, England, Finland, France, Germany, Isreal, Japan, The Netherlands, Scotland, Sweden, and the United States. Within each country four types of samples were obtained based upon both experience with and type of mathematics instruction. These samples are described in detail in the section below.

b. Each of the four types of samples described below was tested in every country included in this study. The broad categories of students were distinguished and labeled "Population 1" and "Population 3". Population 1 includes all students studying in institutions not primarily concerned with the goals of college or university preparation. Population 3 included those schools "from which university or

equivalent institutions of higher learning normally recruit their students". Each of these two groups was subdivided as follows:

Population 1a: All pupils who were 13.0-13.11 years of age at the date of testing

1b: All pupils at the grade level where the majority of pupils of age 13.0-13.11 are found

3a: All pupils "studying mathematics as an integral part of their course"

3b: All pupils "studying mathematics as a complementary part of their studies"

2. Sampling procedure: a two-stage probability sampling procedure was used.

a. A random sample of schools in each population described for each participating country was drawn.

b. Within each school selected, a random sample of students was selected.

c. Countries eventually participating in the study were those expressing an interest in such research by sending representatives to the UNESCO Institute of Education Assemblies. The basic sampling problem was that of securing a representative sample of age and grade level groups in each country.

3. Size of sample:

a. The range of schools sampled was from 8 schools in France to 395 schools in the United States.

b. The range of the number of students was from 50 students (one of the four samples in the Netherlands) to 6,544 students in the United States.

Approximate numbers:

150,000 students
13,000 teachers
5,300 headmasters

4. Sex: approximately equal numbers of males and females with the exception of population 3a which consisted of 75% males.

5. Racial composition: not reported.

6. Religious composition: not reported.

VII. Instruments and Measurements:

All of the instruments used in the study were developed by the research team specifically for this study.

1. The International Project for the Evaluation of Educational Achievement (IEA) Mathematics Test

designed to measure student aptitudes and abilities in the following content areas:

a. Basic and advanced arithmetic
b. Elementary and intermediate Algebra
c. Euclidian and Analytic Geometry
d. Sets, Trigonometric and circular functions
e. Analysis, Calculus, Porbability, Logic and Affine Geometry

2. The Student Opinion Booklet, designed to determine:

a. Student's description of mathematics teaching and learning
b. Student's description of school and school learning
c. Student's attitudes toward mathematics as a process; difficulties in learning mathematics; and the place of mathematics in society.

3. Student Questionnaire (STQ), designed to measure:

a. Student personal characteristics
b. Student interests and future educational and vocational plans

4. Teacher Questionnaire (TCHQ), designed to determine:

a. Teacher experience, training and views
b. Teacher ratings of the relevance of the IEA Mathematics test for their students

5. School Questionnaire (SCHQ) for School Administrator or Headmaster, designed to obtain information regarding:

   a. The type of school
   b. Practices of the school
   c. School personnel
   d. School financial situation

6. The National Information Questionnaire (NATQ), responded to by an expert on the educational system of each country, designed to gather qualitative and quantitative data on the structure of the educational system of that country.

VIII. Vairables Studies:

1. Student Variables:

   a. Aptitude and ability in:

      1. Basic and advanced mathematics
      2. Algebra
      3. Geometry
      4. Trigonometry, Calculus, Probability, Logic and Affine Geometry

   b. Student's perceptions of mathematics teaching and learning
   c. Student's descriptions of school
   d. Student's attitudes toward mathematics as a process and the place of mathematics in society
   e. Student's attitudes: difficulties in learning mathematics

f. Student's interests and educational and vocational aspirations

g. Personal characteristics (e.g., age, sex)

2. Environmental Variables - Family

a. Socioeconomic level measured by level of Father's occupation and parents' level of education

b. Place of residence (e.g., urban, rural)

3. Environmental Variables - School

a. Type of school (e.g., selective, comprehensive, non-coeducational)

b. General practices of the school (e.g., using inquiry-centered techniques, age of initial enrollment)

c. School finances (e.g., per-pupil expenditure, teacher salaries)

d. Teachers' experience, training and attitudes toward their school and teaching

4. Environmental Variables - Community (Country)

Structure of the educational system of the country (e.g., comprehensive, selective)

IX. Statistical Procedures:

1. Descriptive statistics including central tendency and variability indices

2. Frequency distributions

3. Items analyses including difficulty and discrimination indices

4. Univariate 7 ratio comparisons

5. Correlation matrices

6. Multiple regression analyses

X. Relevance to NAEP Study

This is the first of a series of national assessment studies and sets the pattern for subsequent analyses. Like all of the International Studies the analysis distinguishes between the school and the student as units for analysis. Also, the number of variables for which data were collected is extensive, particularly with regard to home/school environment.

I. George W. Mayeske, Albert E. Beaton, Jr., Tetsuo Okada, Wallace M. Cohen, and Carl E. Wisler

II. *A Study of the Achievement of Our Nation's Students.* (See Section X for additional reference materials used in the analysis.)

III. DHEW Publication No. (OE) 72-131. Office of Education, Department of Health, Education, and Welfare, Washington, D.C., 1973.

IV. Objectives:

1. To re-assess and examine the data collected in the Coleman-USOE Study. This re-assessment is directed to the following general question: to what extent is individual student achievement in school associated with aspects of home background and school environment?

2. To explore different aspects of family background and of the school as they relate to the achievement of students of different racial-ethnic and sex-group memberships and of students in different regions in the country.

3. To identify those aspects of the student's background, whether alone or in juxtaposition with school aspects, that play the largest role in student school achievement.

4. To serve as a reference source by summarizing and displaying structural properties of the data and to show how these structural properties permit information to be obtained about the possible effects of family background and school influences on student achievement.

5. To develop a model of the educational process as it relates to student achievement.

V. Design of the study:

1. The study was a re-assessment and examination of the Coleman-USOE data and conclusions.

2. No new sampling was done but the obtained data was analyzed extensively.

3. The unit of analysis was the individual student, using differences among students, differences among schools, and differences among students within a school.

4. a. Items from the Coleman study were empirically scaled and empirically grouped into indices, so that the 400 items of the USOE study could be grouped into manageable units.

b. Variables were placed into a conceptual set of two major divisions, each with two sub-divisions.

1. Family Background

1.a. Home Background-social structural aspects

1.b. Family Process-attitudes of parents and student

2. School Characteristics

2.a. Student Body Characteristics - student attributes

2.b. Comprehensive Set of School Variables

c. Outcome variables were student achievement and student school attitudinal development.

5. Instruments (in the Coleman study) were designed to measure:

a. Student achievement
b. Student attitudes
c. Family environment
d. Home environment
e. School environment
f. Teaching environment

VI. Description of the sample: (See Coleman study)

VII. Instruments and Measures: (See Coleman study)

VIII. Variables Studied:

Background variables

1. Student race/ethnic group membership - white, Oriental, Puerto Rican, American Indian, Mexican-American, Negro, other.

2. Student sex

3. Region of school - Metropolican, Non-metropolitan, North, South

4. Student grade in school - 1, 3, 6, 9, 12

Intermediate variables

1. Family Background

   a. Home Background

      1. SES - parents' educational level, father's occupation, place of residence, size of home, intellectual climate of home.

      2. Family structure and stability - both parents at home, income of parents, mother works or not, residential mobility.

   b. Family Process

      1. Expectations for excellence - parents' expectations for student in school, student's own expectations.

      2. Attitude toward life - work ethic, opinion about efficacy of education in life, opinion about the rigors of life, estimation of the difficulty of learning.

      3. Educational plans and desires - parents' educational expectations for the student, student's own expectations, student's self-esteem with respect to school ranking.

4. Study habits - discussion with parents about school work, reading habits, T.V.-watching habits, truancy.

Student Body Characteristics (for each grade level in school)

SES
Family structure and stability
Racial/Ethnic group membership
Expectations for excellence
Attitude toward life
Educational plans and desires
Study habits
Achievement

Comprehensive Set of School Variables

All but seven of the 31 variables are indices. There were no problems of measurement at the lower grade levels.

Facilities

Plant and physical facilities
Instructional facilities
Pupils per room
Age of buildings

Pupil Programs and Policies

Tracking
Testing
Transfers
Remedial Programs

Free milk and lunch programs
Accreditation
Age of texts
Availability of texts
Pupil-teacher ratio
Enrollment

School Personnel and Personnel Expenditures

Principal's experience
Principal's training
Principal's college attended
Principal's sex
Principal's estimate of the school's reputation
Specialized staff and services
Teacher's experience
Teacher's training
Teacher's socio-economic background
Teacher's localism
Teacher's college attended
Teaching conditions
Teaching-related activities
Preference for student-ability level
Teacher's sex
Teacher's Racial-ethnic group membership
Teacher's vocabulary score

Outcome variables

1. Student achievement

reading and arithmetic achievement
reading comprehension and mathematics achievement
general knowledge

2. Student school outcomes

expectations of excellence
attitude toward life
educational plans and desires
study habits

IX. Statistical Procedures:

1. Correlation analyses
2. Square multiple correlations
3. Multivariate commonality analyses
4. Commonality analyses
5. Regression analyses
6. Sequential analyses

X. Relevance to the NAEP Study:

This document provides one of the principal sources of conclusions about individual student performance (in contrast to average school performance reported in A Study of Our Nation's Schools. Two auxiliary documents used in the analysis are:

1. The appendices to the working paper entitled "A Study of Our Nation's Schools," (same authors). These appendices report simple and partial correlation coefficients, averages of criterion scores, etc.

2. Mayeske, Weinfeld, Beaton, Davis, Fatters, and Hixon, "Stern response Analysis of the Educational Opportunities Survey Student Questionnaires," NCES Technical Note Number 64, April 1968.

These reports are an important source because they provide the quantitative support for the conclusions reached in the published report. They also provide the basis for our computation of percent of variance explained.

The Mayeske, et al, reports as a group represent the most comprehensive source of the kinds of data we have looked for in this study.

I. George W. Mayeske, Carl E. Wisler, Ablert E. Beaton, Jr., Frederic D. Weinfeld, Wallace M. Cohen, Tetsuo Okada, John M. Proshek, and Kenneth A. Tabler

II. *A Study of Our Nation's Schools.* (See Section X for additional reference materials used in the analysis.)

III. Office of Education, Department of Health, Education, and Welfare, Washington, D.C., 1970.

IV. Objectives:

1. To re-assess and examine the data collected in the Coleman-USOE study. This re-assessment is directed to the following general questions: what characteristics of the schools seem to be related to school outcomes and what aspects of the schools might be most important in producing these outcomes?

2. To discover what differences among schools are related to school outcomes and how both are related to the socioeconomic background and racial/ethnic group membership of the students.

3. To serve as reference source by summarizing and displaying structural properties of the data and to show the extent to which the structural properties of the data will permit answers to be obtained about the possible influences that schools may have on their students.

4. To identify the percent of school outcome associated with distinguishable influence of the schools' characteristics; the percent of school outcome associated with the distinguishable influence of the students' social background; and the percent of school outcome that could just as well be associated with either one.

V. Design of the Study:

1. The study was a re-assessment and examination of the Coleman-USOE study data and conclusions.

2. No new sampling was done but the data obtained was manipulated many ways for the purposes of the present study.

3. Data was aggregated to the school level, comparing differences between schools, in order to answer the general question: how do the schools' characteristics influence such things as the average achievement level of the students in school?

4. a. Items from the Coleman study were grouped into indices of related items, so that the 400 items of the USOE study could be reduced to a manageable number. The grouped indices were then divided into 3 major divisions:

Students' Social Background
Schools' Characteristics
School Outcomes

4. Outcome variables were in terms of student achievement, student educational attainment, student attitudes.

5. Instruments (in the Coleman study) were designed to measure:

   a. student achievement
   b. student attitudes
   c. family environment
   d. home environment
   e. school environment
   f. teaching environment

VI. Description of the sample: (See Coleman study)

VII. Instruments and Measures: (See Coleman study)

VIII. Variables Studied:

Background variables

- Student sex
- Student age
- Student race/ethnic group membership
- Community of residence
- Student grade

Intermediate Variables

STUDENTS' SOCIAL BACKGROUND

Expectations for Excellence (Index 1)

-mother's desire for child's academic excellence
-father's desire for child's academic excellence
-student's own desire to excel
-teacher's expectations for student to excel

Socio-Economic Status (Index 2)

-type of community in which student has spent most of his life
-number of siblings
-number of rooms in the home
-father's occupational level
-father's educational level
-mother's educational level
-appliances in the home
-reading materials in the home

Attitude Toward Life (Index 4)

-life condition
-work for success
-difficulty getting ahead
-education in job
-sacrifice to get ahead
-want to change
-learning problems
-teaching rate
-successful life
-ability to do many things well
-liked by classmates

Social Confidence (Index 3)

-outside work
-social rating
-success in life
-tough job
-ability to do many things well

Family Structure and Stability (Index 5)

-area in which student has spent most of his life
-who acts as your father
-who acts as your mother
-family's source of income
-mother's work
-recency of change in school
-frequency of changes in schools

Educational Desires and Plans (Index 6)

-father's desire for child's educational level
-mother's desire for child's educational level
-student's desire for higher education
-student's plans for college
-brightness
-occupational level preferred
-good student

Study Habits (Index 7)

-school discussions with parents
-preschool reading
-number of books read during summer

-number of hours watching TV
-attitude toward school
-study time
-voluntary absences

Classroom Behavior (Index 8)

-gets along well with classmates
-avoids disturbing classmates
-arrives at school on time
-shows desire to learn
-shows good speaking vocabulary
-pays attention in class
-moves from activity to activity progressively
-assumes responsibility

SCHOOL CHARACTERISTICS

Teacher

Experience (Index 1)

-age
-number of years teaching
-number of years teaching in this school
-expects to remain in teaching until retirement

Teaching Conditions (Index 2)

-student effort
-student ability
-reenter teaching
-prefer other school
-school reputation

-school problems:
External
-school problems:
Internal
-ability grouping taught

Localism of Background (Index 3)

-area speng most of life
-area graduated high school
-area of undergraduate institution

Socio-Economic Background (Index 4)

-type/size of community spent most of life
-father's occupational level
-father's educational level
-mother's educational level

Training (Index 5)

-highest degree held
-certification
-salary
-tenure

College Attended (Index 6)

-undergraduate institution attended
-highest degree offered by teacher's undergraduate institution
-teacher's ranking of academic standing of undergraduate institution

Teaching-Related Activities (Index 7)

-attends summer institutes for teaching the culturally disadvantaged
-member of teachers associations
-reads educational journals
-hours a day spent in classroom preparation
-hours a day spent in counseling (in addition to his official assignment)

Preference for Student-Ability (Index 8)

-type of high school preferred
-socio-economic background of students preferred
-preference for high-ability students

PRINCIPAL/SCHOOL CHARACTERISTICS

Plant and Facilities (Index 1)

-area of plant
-central library
-auditorium
-gymnasium
-cafeteria
-athletic field
-kitchen
-infirmary or health room

Principal's Experience (Index 2)

-number of years as a principal
-number of years as a principal in this school
-years of age

Principal's Training (Index 3)

-highest degree held
-salary

College Attended (Index 4)

-ranking of undergraduate institution
-highest degree offered by undergraduate institution
-location of undergraduate institution

Instructional Facilities (Index 5)

-number of volumes in the library
-shop
-biology labs
-chemistry labs
-physics labs
-foreign language labs
-typing rooms
-movie projector
-extracurricular activities

Specialized Staff and Services (Index 6)

-free kindergarten
-art teacher
-music teacher
-speech teacher
-mental health provisions
-remedial reading teacher
-number of guidance counselors
-librarian
-nurse
-attendance officer
-special classes

Tracting and Ability Grouping (Index 7)

-ability grouping or tracking
-proportion of students in highest track
-proportion of students in lowest track
-proportion of students moved to higher track
-proportion of students moved to lower track
-accelerated curriculum

Frequency of Testing (Index 8)

-frequency of intelligence testing
-frequency of achievement testing
-frequency of interest testing

Pupil Transfers (Index 9)

-percent of pupil transfers in
-percent of pupil transfers out

Remedial Programs (Index 10)

-percent of students in remedial math
-percent of students in remedial reading

Free Milk and Lunch Programs (Index 11)

-percent of students who get free lunch
-percent of students who get free milk

Accreditation (Index 12)

-state accreditation
-regional accreditation

Age of Texts (Index 13)

-age of texts
-date of reading books (elementary) or date of biology test (Secondary)

Availability of Texts (Index 14)

-tests provided
-sufficient texts available

Outcome Variables

Student Achievement

-verbal ability (all grades)
-nonverbal ability (all grades)
-reading comprehension (grades 3-12)
-mathematics achievement (grades 3-12)
-general information (grades 9, 12)

Student Attitudes

-expectations for excellence
-attitude toward life
-educational plans and desires
-study habits

Student Educational Attainment

-percent 12-grade graduates going on to college
-percent 12-grade nonwhite graduates going on to college

-percent 12-grade graduates going on to vocational training
-percent 12-grade nonwhite graduates going on to vocational training
-percent 10-grade boys who drop out of school before completion of 12th-grade

IX Statistical Procedures:

1. Proportion of variance
2. Criterion scaling
3. Factor analyses
4. Regression analyses
5. Partition of multiple correlations
6. Principal components analyses
7. Varimax rotations
8. Squared multiple correlation analyses
9. Stratified regression analyses

X. Relevance to the NAEP Study

This document provides one of the principal sources of conclusions about school effects. Two auxiliary documents used in the analysis are:

1. The appendices to the working paper entitles "A Study of Our Nation's Schools," (same authors). These appendices report simple and partial correlation coefficients, averages of criterion scores, etc.

2. Mayeske, Weinfeld, Beaton, Davis, Fatters, and Hixon, "Stern response Analysis of the Educational Opportunities Survey Student Questionnaires," NCES Technical Note Number 64, April 1968.

These reports are an important source because they provide the quantitative support for the conclusions reached in the published report. They also provide the basis for our computation of percent of variance explained.

The Mayeske, et al, reports as a group represent the most comprehensive source of the kinds of data we have looked for in this study.

I. Alan C. Purves

II. *Literature Education in Ten Countries*. International Studies in Evaluation II.

III. Stockholm, Sweden: Almquist and Wiksell, 1973.

IV. Objectives:

1. To examine the relationships between facets of the Achievement-in-Literature study.

2. To examine and explicate the relationships between these facets of achievement and major characteristics of students, their backgrounds, their curricula, and their instruction.

3. To assess the differences among nations in the ways literature study is approached and taught, delineating the relationships between stated aims and actual outcomes.

4. To examine the influences of schools and teachers on student achievement in literature study.

V. Study Design:

1. Study was a cross-national survey: Belgium (French- and Flemish-language speaking), Chile, England, Finland, Iran, Italy, New Zealand, Sweden, and the United States.

2. Planning for the study began in 1964; testing of instruments and design began in 1966. Questionnaire administration was completed in 1971. Instruments were administered only once.

3. Sampling:

   a. Primary sampling unit was the school, selected within country by probability proportional to its enrollment. All data were aggregated to school level.

   b. For each country, probability samples were drawn from the defined target populations:

      Population II - students aged 14; last point before significant drop-outs occur

      Population IV - students in the last grade before entrance into the university

   c. All literature teachers and all teachers of the mother tongue in the school to be surveyed.

   d. Each school to be surveyed for school characteristics; addressed to school principal.

4. Instruments were constructed to measure:

   a. student cognitive achievement in literature
   b. student response patterns to literary works
   c. student transference of reading experiences to everyday life
   d. student characteristics
   e. teacher characteristics
   f. program characteristics
   g. school characteristics

VI. Description of the sample:

1. All countries except the United States and Iran used two-stage sampling.

   a. First stage was to stratify schools according to sex and age of students, size of school and urban-rural character and then to draw a random sample of schools;
   b. Second stage was to draw a subsample of students within these schools, by class.

2. United States and Iran used three-stage sampling.

   a. First stage was the sampling of communities and administrative units;
   b. Second stage was sampling of schools;
   c. Third stage was subsampling of students.

3. Responses of school principals were a consensus among all literature teachers and teachers of the mother tongue in the school surveyed.

4. Numbers responding to survey:

	Population II		Population IV	
	Total	US	Total	US
Number of schools responding	1,092	145	884	115
Number of teachers responding	3,133	343	3,640	383
Number of students responding	23,392	3,344	29,014	2,472

VII. Instruments and Measures:

1. Reading tests to measure students' work knowledge and reading comprehension.

2. Student Attitude Questionnaire, to measure student interests in literature and transference of their reading experiences to their everyday lives.

3. Student Questionnaire, to collect data on family characteristics and home environment.

4. Student Questionnaire - literature, to measure students' interests and activities in reading.

5. Teacher Questionnaire, to collect data on teacher characteristics, teaching practices.

6. School Questionnaire, to collect data on school characteristics.

VIII. Variables studied:

Background variables

- Student age
- Student sex

Intermediate variables

- Student characteristics
  - Home handicap score: Father's occupation, father's education; mother's education, use of dictionary in the home; number of books in the home; family size
- Study of literature measures
  - Size of class and amount of instruction
  - Relation of literature to other mother-tongue instruction
  - Emphasis given to the various genres
  - Transference
- Age
- Sex
- Grade
- Preferred subjects in school
- Amount of homework per week
- Expected occupation
- Amount of reading for pleasure

Items from the Student Questionnaire for the Reading Study:

- Reading preferences
- Genre preferences
- Literary medium preferences

Teacher characteristics

- Sex
- Age
- Degree of specialization
- Whether teaching subject of specialization
- Amount and type of education
- Amount of interest in professional matters
- Preferred mode of evaluation of student achievement
- Perception of determinants of curriculum

School characteristics

- Locale
- Size
- Urban/rural
- Availability of cultural resources
- Type of program
- Sex make-up
- Curricula offerings
- Budgeting and per-student expenditures

Outcome variables:

- Student verbal ability
- Student word knowledge
- Student ability to read passages for comprehension
- Student transference of reading to everyday life

IX. Statistical Procedures:

1. Correlation analyses
2. Multiple regression analyses

X. Relevance to the NAEP Study

This is an important report in the International Evaluation Series. For our purposes, expression of the associations in terms of explained variance was particularly useful.

I. Marshall S. Smith

II. "Equality of Educational Opportunity: The Basic Findings Reconsidered"

III. Chapter 6 in Frederick Mosteller and Daniel P. Moynihan, eds., *On Equality of Educational Opportunity*. New York: Vantage Books, 1972.

IV. Objectives:

1. To re-examine the Coleman-USOE data and methodology that engendered the following five controversial conclusions:

   a. the relation of family background to achievement does not diminish over the years of school

   b. family background accounts for a substantial amount of the school-to-school variation in achievement and, therefore, variations in school facilities, curriculum, and staff can only have a small independent effect.

   c. there is a small amount of variance explicitly accounted for by variations in facilities and curriculum.

d. although no school factor accounts for much variation in achievement, teacher characteristics account for more than any other.

e. the social composition of the student body is more highly related to achievement, independently of the student's social background, than is any school factor.

2. To focus on the validity of these five conclusions and on the effects that mistakes in the original analysis had on the Coleman Report.

3. To examine the validity of two further inferences made by Coleman: that effects of school achievement increases over a student's years in school; that variations in school resources have a greater effect on the achievement of minority groups than on the achievement of whites.

4. To measure the relationships between the schoolwide resources and student achievement.

5. To extend the original Report by exploring various interpretations of the data.

6. To examine the policy implications suggested by this research.

V. Design of the Study:

1. This study was a re-assessment and manipulation of the Coleman data. No new sampling was done and no new variables were introduced.

2. The population was restricted, however, to only black and white students in grades 6, 9, and 12 in Northern schools only.

3. Coleman variables were rearranged or omitted in some cases.

4. Student verbal achievement was the outcome variable, with three schoolwide factors as independent variables: Facilities and Curriculum, Student Body, Teacher Characteristics. The Home Background factor was the control in assessing the relationships between student achievement and schoolwide resources.

VI. Description of the Sample.

1. The study made no changes in the Coleman sampling scheme.

VII. Instruments and Measures:

1. The study introduced no new variables into the study.

VIII. Variables Studied:

Background variables

student grade

student race--white/black

Intermediate variables

Home Background Factor

-urbanism of pupil and parents

-parents' education

-structural integrity of the home

-home items (appliances)

-number of reading items in the home

-number of siblings

-parents' interest in child's school experiences

-parents' desires and expectations of child's success in school

Student Body Factor

-proportion of students who own encyclopedie

-student transfers

-attendance

-average hours spent on homework

-proportion who plan college

-student body quality (rated by teacher)

School Facilities and Curriculum Factor

a. descriptive school measures: size, location

b. physical resource measure: quanity of resources, per pupil expenditure systemwide, library volumes per student, number of science labs, guidance counselors

c. descriptive curriculum and program resources: comprehensiveness of cirriculum offerings, accelerated curriculum, tracking, movement between tracks, proportion of slow learners, extracurricula activities.

Teacher Characteristics

a. Ascribed: proportion of teachers in school who are white, average educational level of teachers' mothers
b. Achieved: average teacher verbal score, average teacher educational level, average localism of teacher
c. Professional commitment and Preferences: average years teaching experience, average teachers' preference for type of student body.

Outcome variable

Student verbal achievement

IX. Statistical Procedures:

1. Regression analyses
2. Correlation analyses
3. Multivariate analyses of variance

X. Relevance to NAEP Study

This study is an important reanalysis of the Coleman data with emphasis on the student as the unit of analysis.

I. Robert L. Thorndike

II. *Reading Comprehension in Fifteen Countries.* International Studies in Education.

III. New York: John Wiley & Sons, 1973.

IV. Objectives:

1. To study reading performance and the factors that are related to that performance in a group of countries.

2. To develop and assess predictors for, and so account for differences in, reading ability, on three levels:

   a. differences among individual students in each country, without regard to the particular schools.

   b. differences in average performance among schools within the same country.

   c. differences among countries in overall average achievement.

3. To examine background and school factors, within and among countries, that may account for differences in reading comprehension.

4. To compare results in Reading Achievement with other cross-national studies in Science and Literature.

V. Design of Study:

1. Study was a cross-national survey: Belgium (French- and Flemich-language speaking, Chile, England, Finland, Hungary, India, Iran, Isreal, Itlay, Netherlands, New Zealand, Scotland, Sweden, and the United States.

2. Sampling:

   a. Primary sampling unit was the school, selected by probability according to various stratifications

   b. In each country, subsamples of students were randomly selected from sample schools:

      Population I--students 10 years old
      Population II--students 14 years old
      Population IV--students in last year of secondary school

   c. In each school, sample of teacher was selected

d. For school information, a consensus for the school was attained.

3. Instruments were to measure:

a. student reading comprehension through tests focusing on cognitive content of reading passages
b. student characteristics
c. background factors and home/family characteristics
d. school factors
e. teaching factors
f. indigenous national factors

IV. Description of the sample:

1. Two-stage sampling was used in each country

a. Schools were stratified by region, type of school, size of school and a random sample was drawn.

b. Within each school, a random sample of students was drawn, usually selecting all individuals whose birthdays fell upon randomly selected days of the month. This selection was done by the IEA National Center of each country, rather than by the schools, to avoid school bias in selecting or excluding students.

2. Probability samples were drawn from the following target populations:

   Population I--students 10 years of age
   Population II--students 14 years of age
   Population IV--students in last year of secondary school

3. Weights were developed to adjust for over- and under-sampling

4. Teachers were selected within each school on random basis

5. Each sampled school was surveyed for school information.

6. Information was collected for:

	Pop I	Pop II	Pop IV
Number of students	34,344	39,307	29,474
Number of teachers	Not given	Not given	Not given
Number of schools	1,670	1,752	1,209

VII. Instruments and Measures:

1. To measure student reading ability:

   a. conventional-type reading comprehension test, presenting a passage and asking questions about the passage, which is available for reference and re-reading

b. a test of reading speed, consisting of a short paragraph ending with a question, and followed with three words, one of which is to be underlined as answering the question

c. a test of word knowledge, format of word pairs to be jduged as synonyms or antinyms

2. To collect information on student characteristics, home characteristics, family characteristics, student interests, attitudes, and aspirations

--Student Questionnaire

3. To collect information on school facilities, services, curriculum, pedagogical methods, teacher characteristics

a. School Questionnaire
b. Teacher Questionnaire

4. To collect information about national cultures and educational systems

a. National Case Study Questionnaire, to be completed by the IEA National Center for each country

5. Student background information pooled for all individuals in a given country; school variables are related to differences in average reading achievement of students

VIII. Variables Studied:

Background variables:

Student age
Student sex
Home Handicap index
-Father's occupation, Father's education, Mother's education, dictionary in the home, size of family
SES index
-father's occupation (for Population I)
-father's occupation, mother's education, father's education (for Populations II and IV)

Intermediate variables:

Home/Family
-reading resources
--dictionary in the home, wether newspaper received in the home or read by the student
--number of books in the home
-parental interest and involvement in schooling
--parents' expressed interest in school
--encouragement to read
--encouragement to visit museums
--parents help with homework
--parents correct speech of student
--parents correct writing of student
Student characteristics
--occupational aspiration
--educational aspiration
--literary medium preferences

--genre preferences
--reading preferences
--liking of school measure
--motivation
--literary interest
--science interest (from IEA Science study)

Teacher characteristics
-sex
-age
-years' teaching experience
-professional association
-education
-teaching specialization
-teaching methods

School characteristics
-size
-type of school
-resources
    --library
    --class library
    --number of librarians
    --number of reading specialists
    --ancillary personnel
    --referral services for poor readers
-expenditures per-student
-teacher/student ratio
-teaching practices
    --individualized instruction
    --class groups according to ability

National cultural variables

-economic development

Outcome variables

-student reading achievement
--student reading comprehension
--student word knowledge

IX. Statistical Procedures:

1. Correlation analyses
2. Multiple regression analyses
3. System step-wide regression analyses
4. Difficulty and Discriminant analyses
5. Factor analyses

X. Relevance to the NAEP Study

Scores on reading achievement were used as an input variable in the analysis of International Evaluation results in Science and Literature. In that sense, one might consider reading achievement to be a measure of ability. By using reading achievement, the percent of variance explained was materially increased.

I. Dale Tillery

II. "Scope: School to College: Opportunities for Post-Secondary Education (Abstract)"

III. In Clare Rose and James W. Trent, *An Analytical Review of Longitudinal and Related Studies As They Apply to the Educational Process -- Research in Retrospect: Implications for the Future*, Vol. 4. Center for the Study of Evaluation, University of California Graduate School of Education, Los Angeles, California, December 1972.

IV. Objectives:

1. Determine the relationships that student characteristics, in terms of personal characteristics, family background, and educational opportunities, have with different school experiences, aspirations, attitudes, and decisions about post-secondary education.

2. Determine the process (how, when, and why) and the stages of student educational and career decision-making during high school years; determine the influences of parents, schools, and peers upon the nature of those decisions.

3. Analyze the differences among defined clusters of students; analyze change and constancy of these groups over time; study those students who deviate from the peer groups on important variables.

4. Assess the congruence between students' perceived strengths and their stated aspirations and elucidate as to how the students view their decisions in retrospect.

V. Study Design.

1. Study was longitudinal, over a six year period, with test-retest on the same sample. Major testing points at grades 9, 12, and near the end of the first year of college.

2. Data collected from school records, follow-up questionnaires, and selective interviews for intervening years (grades 10 and 11). Follow-up data was obtained in 1968 for the 1966 9th grade sample; in 1970 for drop-outs and other sub-groups.

3. Cross-sectional data was analyzed as well as data from randomly selected sub-groups of students who attended college and students who did not attend college.

4. Students in cross-sectional studies were stratified by sex and educational aspirations. Aspirations were: leave school, graduate from high school, attend junior college or some special technical-vocational school, graduate from a four-year college, seek a post-graduate college degree.

5. Sampling procedure:

Multi-state proportional random-sampling procedure.

a. Counties in each of the states were statistically grouped into similar clusters on the basis of:

1. median family income
2. proportion of white collar workers
3. white and nonwhite racial composition
4. mobility of the population
5. rate of school attendance of school age children
6. school size
7. ratio of students who go to college to high school graduates

b. Counties were then randomly selected from within each cluster of counties in each of the four states.

c. School districts, then schools, were randomly selected from within the selected counties so that there would be samples of grade 9 and grade 12 students large enough to meet the requirements for the initial sample sizes.

d. Eight non-overlapping a priori clusters of students based on statistically defined factors were established at the beginning of the

longitudinal study. The eight clusters are defined in reference to three dimensions:

1. High/low "school ability"
2. High/low family socioeconomic status
3. High/low educational opportunity

6. Limitation of study due to sampling:

a. The authors state that caution should be used in making generalizations about students as a result of examining the data since some students were away when the testing was done and some students chose not to participate. It is not known what effect this may have upon the representativeness of the state samples.

b. Loss of a large metropolitan school district in Massachusetts which chose not to participate was not replaced by other volunteer schools. The public school systems are underrepresented in both grades 9 and 12 with respect to some of the characteristics of large urban areas.

With respect to the four-state composite, however, the size of the sample and range of types of schools sampled should reflect the attitudes, abilities and interests.

VI. Description of Sample:

1. Size of sample:

	9th graders	12th graders
California	8,204	7,757
Illinois	14,338	10,881
Massachusetts	11,673	9,793
No. Carolina	21,846	12,555
Total 97,047	56,061	40,986

Through the use of appropriate theoretical models, it was determined that 3,954 students should be available for the final data collection in each of the four states. The initial sample sizes then took into consideration persistence rates and drop-out rates of students through each period of schooling, college-going rates in the four states, and a general persistence rate during the first year of college.

Units of sampling: Individual schools
244 public schools
55 non-public schools

2. Population: All 9th and 12th grade students enrolled in high school for the spring semester, 1966 in California, Illinois, Massachusetts and North Carolina.

Four states chosen on the basis of the following criteria:

a. They have different traditions regarding commitments to public and private higher education.

b. They reflect the traditions and educational beliefs of the major regions of the nation, although they cannot be considered statistically representative of such regions.

c. They represent leadership in major aspects of higher education.

d. They have recent master plans for higher education.

3. Racial composition: not reported.

4. Religious composition: not reported.

VII. Instruments and Measurements

A. Student questionnaires were designed to measure

1. Proficiencies and talents
2. Home characteristics: SES, style of living, composition of members of household, psychological environment of home.
3. Patterns of identification with peer group members.
4. Influence of others (e.g., perceived characteristics of others, parents, school personnel, ideal persons)
5. Decision-making process including information-seeking behavior regarding education and career.

B. Standardized tests to measure aptitude, achievement-motivation, intellectual orientation and values, vocational interests.

C. Principal questionnaires designed to gather basic data about schools and personnel.

VIII. Variables Studied

Background variables

1. Physical health and development
2. Race
3. SES measured by Father's occupation; composition of members of household; psychological and physical environment of home.

Intermediate variables

1. Academic aptitude and achievement
2. Achievement motivation
3. Educational and vocational aspiration
4. Interests, talents; values and beliefs; intellectual orientation
5. Information-seeking behavior regarding education and career
6. High school and college activities and attitudes toward those school experiences
7. Peer affiliation and peer culture
8. School curriculum; teachers; counselors
9. Resources and services of school
10. Community characteristics (e.g., SES of population, library facilities, commitment to education)
11. State influences (Master plans, financial aid, types of institutions available, governance of institutions

Outcome variables

1. Persistence
2. Transfer
3. Evaluation of educational decisions

IX. Statistical Procedures

1. Analysis of Principal Components

2. Cross-sectional Analysis of Cluster Differences

   a. Analysis of variance and covariance
   b. Wilcoxon test for matched samples with ranks
   c. Bartlett's test for homogeneity of variance

3. Cross-sectional Multivariate Discriminant Analysis

4. Longitudinal Analysis of Clusters

   a. Chi square test for significance of changes
   b. Markov process for measuring changes and constancy
   c. Friedman's test
   d. Pearson's rank correlation coefficient
   e. Multiple regression methods

5. Longitudinal Multivariate Discriminant Analysis of Clusters

6. Analysis of Membership of Student Clusters

   a. Markov Analysis
   b. Multivariate analysis of variance
   c. Hotelling's T^2

X. Relevance to NAEP Study

The study is of relevance because it shows association between background measures and post-high school education. The data collected in motivation, attitude, interest, values, high school activities and peer culture are particularly rich. Observed associations should be meaningful even though the study does not represent a probability sample of the United States.